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For: MULTI-USER APPLICATIONS IN MULTIMEDIA NETWORKS

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SUBMISSION OF PRIORITY DOCUMENTS

It is respectfully requested that this application be given the benefit of the foreign filing date under the provisions of 35 U.S.C. §119 of the following, a certified copy of which is submitted herewith:

Application No.	Country of Origin	Filed
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FLERBRUKERAPPLIKASJONER I MULTIMEDIANETT.
(Multi-user applications in multimedia networks)

FIELD OF THE INVENTION.

The invention relates to the field of multi-user applications in systems of networked computers, and more particular to a multi-user computer system, method and arrangement employing multimedia call control, for alleviating problems of operation and administration of multi-user or real-time application programs in systems of networked computers.

THE PROBLEM AREAS.

In systems with networked computers, it is often desirable to allow more than one user to interact with a single application at the same time (concurrently). Such applications are often called multi-user applications. Each multi-user application can be said to belong to one of the following two groups:

1) Multi-user applications with real-time requirements; and,
2) Multi-user applications without real-time requirements.

Typical examples of applications that belong to the first group are multimedia conferencing applications and multi-player games, while multi-user white boarding and word processors with document sharing are typical examples of applications belonging to the second group.

When enabling more than one user to interact with the same application, typically, the users are each provided with parts of the application, hereinafter referred to collectively as clients. The clients then communicate with the remaining parts of the application, hereinafter referred to collectively as the server. The physical location of the server can be a computer shared with one of the participating clients, which typically is the case for word processor sharing and games, or it can be a separate computer such as a dedicated server computer. Use of a separate computer is quite common when the shared application needs more resources than what is available at the location of any of the clients.

A protocol is used for information exchange between the client and the server. Although several standard protocols exist, customised protocols that are optimised for each type of application are commonly employed. The reason for this is that each type of application has its own, specific needs. A typical shared real-time application will often

make use of small data packets to increase transfer speed, while non-real time applications will often make use of larger data packets to decrease the use of communication channel bandwidth for the information exchange.

Network games can be, as mentioned earlier, typical examples of multi-user applications with real-time requirements. In network games, each client runs most of the application locally. This means that the clients send only information to the server about the positions in the game and the current status of their respective players (the type of information, sent and received, is of course dependent upon the type of game). The server then co-ordinates and combines the information received from all clients and sends co-ordinated and combined information back to the respective clients. If only a small number of users, say, less than ten, is supported, then the server is often located with one of the clients. If, on the other hand, a large number of concurrent users are allowed, then the need for computer resources would be greater, and the server in such cases are often assigned separate hardware.

When, in a networked system, each such multi-user application is using its own protocol, this represents a significant problem to the administrator of these protocols, as it is difficult, and sometimes even impossible, for the administrator to perform common administration of the supported multi-user applications. In this context, administration is defined as:

- Methods for access control of who is allowed to communicate with the server
- Trace logs of usage
- Fault handling
- Administration of addresses and users
- All the needed logic to perform user billing of usage of the server
- Other types of administration

Yet another problem encountered in such situations is to enable the different multi-user application protocols to pass through a firewall. This is especially difficult with multi-user applications with real-time requirements, because such applications often use the User Datagram Protocol (UDP) as a transport protocol. Due to the connectionless nature of UDP, it is difficult to allow UDP based traffic to pass through a firewall and at the same time obtain good protection by the firewall.

Another problem related to using one of the standard call control protocols for multi-user server communication is that the existing means for transporting information, hence not session initiation information, in current solutions are based on codecs that are optimised for voice, video or other non real-time data transfer. For transport of real-time data, these codecs are not suitable.

Furthermore, it would be beneficial if all multi-user applications that operate in one domain could use the same communication protocol. If they all make use of the same communication protocol, administration problems (e.g. access control, trace logs, etc.) and communication problems (e.g. enable communication through a firewall) could be solved for the common protocol, and hence be used by all multi-user application servers.

KNOWN SOLUTIONS AND PROBLEMS WITH THESE.

One suggested solution to the problem of administration is to implement separate support for administration of each type of application. The major problem with this method is, firstly, that for each new supported multi-user application the administration has to implement a new set of administration mechanisms, and secondly, that the administrator has to integrate the new set of administration mechanisms with existing administration for other multi-user applications.

Another suggested solution to the same problem is to support only multi-user applications that use a standardised protocol such as for example the Hyper-Text Transfer Protocol (HTTP). This, however, leads to other problems, as use of a single protocol will make it very difficult to make multi-user applications work in the network because of their different nature and their different resource requirements.

OBJECTS OF THE INVENTION.

It is, therefore, an object of the invention to provide a solution to the problems outlined above, and which overcome the problems of the known solutions

BRIEF DISCLOSURE OF THE INVENTION.

The present invention provides a system recited in the accompanying independent claim 1, a method recited in the accompanying independent claims 2, 8, 9 and 10, and an

arrangement recited in the accompanying independent claim 7. Other advantageous features of the invention are recited in the accompanying dependent claims 3 – 6 and 11 - 14.

The present invention proposes a solution to solve the problem of administration of different multi-user applications by means of the H.323 standard according to ITU-T Recommendation H.323, 02/98 "Packet-based multimedia communications system", which is the standard mostly used for systems providing multi-media traffic today. Establishing and administrating connections between clients and their respective servers by means of H.323, according to the invention, provides the advantage of allowing a system that includes application specific protocols as well as one common standard protocol, namely the H.323.

BRIEF DESCRIPTION OF THE DRAWINGS.

Figure 1 is a block diagram representation of a simplified H.323 network example, illustrating client registration and authorisation.

Figure 2 is a block diagram representation of a simplified H.323 network illustrating set-up of a H.323 client-to-server network call and extended functions.

Figure 3 is a block diagram representation of a simplified H.323 network illustrating client-server information exchange according to the invention through a firewall.

Figure 4 is a schematic representation of an embodiment of a user data packet structure of the invention.

Figure 5 is a schematic representation of an embodiment of a control data packet structure of the invention.

Figure 6 is a sequence diagram illustrating an example of information exchange between server and client in an exemplary embodiment of a solution according to the invention.

Figure 7 is a sequence diagram illustrating an example of information exchange between server and client in another exemplary embodiment of a solution according to the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS.

In the following, the present invention will be described by way of example and with reference to the accompanying drawings.

Referring to fig. 1, when the client is started, it first uses a known registration process of H.323 version 2 to be registered and authorised in the network. It should also be noted that, in the situation illustrated in fig. 1, the server is already registered in the H.323 network. When using H.323, the client side of the application and the server side of the application must both support the H.323 stack. Further, to have full service, the server must be running all the time. Through the registration process, the user is authorised (authorisation is new in version 2 of H.323). This means that the operator can decide who is allowed to contact the server. Up to this point, conventions and interactions in the network are according to the known steps of the H.323 version 2.

Now, referring to fig. 2, when the client initiates a call with the gaming server as the destination, the gatekeeper will check in the users profile, which is received from a User Handling Database (UHD), to see if the users is allowed to use the gaming server, denoted by Gaming Server Info in fig. 1. In order to fetch this data and to perform the evaluation, new functionality is added to a normal H.323 Gatekeeper. If the user is found to be allowed to "call" the gaming server, then the gatekeeper informs the client that he is allowed to make the call set-up as is typically done according to H.323.

Then the client starts the data channel of H.323 towards the server. This is allowed according to H.323, although it is not usually done this way as the procedure usually employed is to start voice and video channels. According to invention, the H.323 protocol is extended to support a new codec. This is shown below:

For the purpose of simplifying the explanation of the solution of the invention by way of example, in the following, H.323 and H.323 names and terms will be employed extensively. A new codec that is specialised for real-time data transfer has to be developed. In H.323 the new codec has to be identified in the ASN.1 syntax as described below:

```
DataApplicationCapability                    ::=SEQUENCE
  {
        application                          CHOICE
        {
            nonStandard                  NonStandardParameter,
            t120                             DataProtocolCapability,
            dsm-cc                           DataProtocolCapability,
            userData                         DataProtocolCapability,
            t84                              SEQUENCE
            {
                t84Protocol
        DataProtocolCapability,
                t84Profile                                T84Profile
            },
            t434                             DataProtocolCapability,
            h224                             DataProtocolCapability,
            nlpid                            SEQUENCE
            {
            nlpidProtocol                DataProtocolCapability,
                nlpidData                    OCTET STRING
            },
            dsvdControl NULL,
            h222DataPartitioning             DataProtocolCapability,
            ...,
            t30fax                           DataProtocolCapability,
            t140                             DataProtocolCapability
            A new codec type                 DataProtocolCapability

        },
        maxBitRate                           INTEGER (0..4294967295),
        -- units 100 bit/s
        ...
  }
```

This basis for the ASN.1 code shown above is described in ITU-T Recommendation H.245, 02/98 "Control protocol for multimedia communication". The code above, being an amended code applicable to solutions according to H.245, shows how the Data Application field of the H.245 protocol is extended to accommodate the invention. In system operating according to the invention, such adaptation of H.245 is included in all clients, servers, and gatekeepers that has registered gaming servers to them (if the gatekeeper is routing h.245). In this context, the particular name of the new codec is not relevant, just that it is a new one. Any requirements for more than one new codec in a particular system will depend on the requirements defined for the communication between the client and the different types of gaming servers. What is important, though, is that a game server and all of its connected clients must provide support for the same codec type.

The new codec is designed in a simple fashion, meaning that it requires little overhead. In the following, some of the characteristics of the new codec are given:

- The codec uses RTP (Real-time transport Protocol) over UDP (User Datagram Protocol) to obtain real-time transport
- The codec includes mainly to types of messages: a) a data message, and b) a control message.
- The data message can be sent from the client or from the server. The control message is only sent from the server.

Referring to figure 4, an example of a data packet of the new codec will now be explained:

- In the Type field is an identifier defining the type of message is (e.g. 1 = data message, 2 =control message); which in this case is a data message.
- In the Protocol field is an identifier defining how the data in the rest of the message shall be interpreted. Note that there has to be a common understanding of the data format among client and server.
- In the Data field is included the data that is sent from the client or from the server

Referring now to figure 5, an example of a control packet of the new codec will be explained:

- In the Type field is an identifier defining the type of message is (e.g. 1 = data message, 2 =control message); which in this case is a control message.
- In the Protocol field is an identifier defining how the Control information in the rest of the message shall be interpreted. Note that there has to be a common understanding of the control format among client and server.
- In the Data field is included the control information that is sent from the server towards the clients. Examples of control information are how often data messages shall be sent from the client towards the server, and how often the server will send data messages towards the client.

Note that time-stamps and sequence numbers is not part of the codec messages, because this information typically can be obtained from the RTP header.

Now, with reference to the accompanying figures 6 and 7, and by way of example, information exchange in a client-server configuration in an embodiment of the invention will be explained. The referenced figures 6 and 7 generally show examples of the communication sequence between a client and a server. In the sequence examples

shown, there are some common steps. The client initiates the communication by sending a "setup" message according to the standard call control protocol which has been selected; that is, generally, H.323 or SIP. Then the server signals accept of the incoming "setup" by sending an accept message according to the selected call control protocol. The call control part of the client then sends a suggested media set and address, including the new codec. Further, as shown in the examples, the suggested media set is accepted by the server by a message that also includes the media destination address to which the client is to send the media. At this point in the sequence, two different possibilities are available. One possibility is that the address is sent from the Call control towards the application part in both the server and the client, in which case it is the application on the client that sends the media using the new codec directly towards the application on the server. This first possibility is illustrated by the further parts of the sequence shown in figure 6. The other possibility is that the Call control on both the server and client sends a "start" message, or a similar kind of information, indicating that communication is now established between the server and the client. In this latter case, media sent in the new codec is first transmitted from the application towards the Call control and then from the Call control on one side over to the other Call control, and then on to the application. This other possibility is illustrated by the further parts of the sequence shown in figure 6. At the termination of a session, the client send a "close" message. However, closing can also be initiated by the server. The entity receiving the "close" message informs the application that the session is over, and responds to the "close" message by sending back an "accept" message.

Now, with reference to figures 4, 5, 6 and 7, the message types and their use will be explained by way of example. In accordance with a sequence as described above, the sever can first send a control message including information specifying the rate at which data is to be be sent form the client to the server, and possibly also information about the data type. In turn, the client sends data to the server at the specified rate and of the specified type, according to the scheme specified in the control message. Such control messages can be sent at any time during a session, in order for the server to specify different data rates and data types according to the needs of the application associated with the session.

With reference to the sequences explained above, it should be noted that the different possibilities illustrated by figures 6 and 7 also can be mixed or combined, in such a way that either the server party or the client party follows one of the sequences, while the other party follows the other sequence.

In H.323 networks with gatekeepers, all signalling must go through the gatekeeper. When the gatekeeper allows set-up and operation of a call, it can, according to known H.323 architecture and implementations, inform the normal charging system of that usage has started. A charging system can be added to a system, such as the system depicted in figure 1, in a number of different ways. A simple and effective way of accomplishing charging, is that the gatekeeper writes information related to call-setup and stop to an ASCII-file. A program can process this file by manual or automatic means at a later stage in time. A more advanced solution is to send Call Detail Records (CDR) to an external system. CDRs can include information about call start time, call stop time, activity, resources used, etc. The external system can then be made to automatically interpret these records and produce a cost of use (charging) to the end-user directly.

Further, as illustrated in figures 6 and 7, when seen in conjunction with the messages describe with reference to figures 4 and 5, when establishing the data channel, the client informs the server of which protocol to use for the data communication. For a system according to invention, this is to be the new codec as described above. This means that the applications themselves can use whichever protocol they desire, as long as it maps into the new codec type. During the H.323 set-up phase, both the client and the server also inform each other of ports on which they want to receive data, and of which transport protocol is to be used, such as e.g. whether they use TCP (Transmission Control Protocol) or UDP (User Datagram Protocol). This information can further be used by a H.323 Proxy to enable the chosen data protocol to be transferred through a firewall, as illustrated in fig. 3. If an H.323 proxy is used, it also will be updated with the enhanced H.323 protocol.

Referring to fig. 3, an example is shown, wherein two clients communicate with the server. They use both the H.323 protocol, which is sent via the gatekeeper, and the chosen data protocol directly. When the data channel is established, the client informs the server of which protocol to use for the data communication. This means that the applications can use any preferred protocol. In figure 3 a firewall is also shown together with a H.323 proxy. The reason for including the proxy functionality is two fold. Firstly, it is quite common to have a firewall at every enterprise and ISP to protect their respective areas. Secondly, NAT (Network Address Translation) is often used by enterprises for sharing one single IP-address, and for not giving away information about IP-address for nodes located inside the domain of the enterprise. H.323 does not include

When the set-up phase is over, the respective client and server use the chosen protocol that is optimised for their needs to transfer data to each other.

When the session is over, the client closes the connections and informs the gatekeeper. The gatekeeper then informs the charging system that the usage of the server has stopped. If a client should become inoperable or a network failure should occur, then the system can also detect this because H.323 requires regular updates of the status of the "call". A correct record of time of usage is therefore guaranteed.

Although only a simple H.323 network is shown in the figures 1, 2 and 3 to simplify the drawings for the purpose of explaining the invention, the solution provided by the present invention will also work in large-scale H.323 networks or in networks having an architecture and/or operating according to similar call control protocols, such as for example the SIP protocol.

ADVANTAGES

By using H.323, the applications can easily be integrated with voice and video if they do not already have this support. This will give some application a new dimension without the need for making large changes the application required otherwise.

When using H.323, the client does not need to know the IP(Internet Protocol)-address of the server, as the H.323 supports more advanced address schemes like E-164 numbers, e-mail addresses or aliases.

Patent claims

1.

A system of computers networked by means of the H.323 protocol or the SIP protocol, each of said systems including at least one Gatekeeper means and at least one each of server and client means for operating a client/server multi-user computer application, and, optionally, a firewall means provided with H.323 or SIP proxy, wherein client registration and authorisation in the network are according to registration and authorisation method of H.323 or SIP,

characterised in a user handling database means associated with said Gatekeeper means, and

that each of said Gatekeeper means, server means and client means comprises a real-time codec having a common H.323 or SIP interface , each of said codecs being adapted to co-operate with the respective Gatekeeper means, server means or client means.

2.

A method for alleviating problems of operation and administration of multi-user computer application programs in systems of computers networked by means of the H.323 OR SIP protocol, each of said systems including at least one Gatekeeper and at least one each of server and client for operating a client/server multi-user computer application, and, optionally, a firewall provided with H.323 or SIP proxy, said method comprising the steps of client registration and authorisation in the network are according to registration and authorisation method of H.323 or SIP, characterised in that the method further comprises:

initiating, by the client, a call set-up with the server as the destination, thereby exchanging information of ports for receiving data and of whether the communication protocol is TCP or UDP,

checking, by the Gatekeeper, in a user profile obtained from a user handling database associated with said Gatekeeper to determined whether or not the client is allowed to make a call set-up towards the server,

informing, by the Gatekeeper, the client of whether or not that the client is allowed to make the call set-up, and

starting, by the client, a data channel towards the server according to an enhanced H.323 or SIP upon the call set-up for which the client is allowed to make, which enhanced H.323 or SIP is enhanced by an extension supporting a specific codec and is operable on

the client and the server, said codec is arranged to be mapped into by a protocol employed by the client and by a protocol employed by the server.

3.

A method according to claim 2, c h a r a c t e r i s e d i n that the method further comprises:
transferring, by the client and upon call set-up, data from the client to the server, and vice versa, by means of a selected protocol mapping into the real-time codec.

4.

A method according to claim 2, c h a r a c t e r i s e d i n that the method further comprises:
closing, the client and when the session established by the call set-up is over, connections between the client and the server, and
informing the gatekeeper according to corresponding methods of H.323 or SIP.

5.

A method according to claim 2, c h a r a c t e r i s e d i n that the client is a game client and the server is a game server.

6.

A method according to claim 2, c h a r a c t e r i s e d i n that the method further comprises:
monitoring , by the gatekeeper, the status of the call set up between the client and the server, and
maintaining a record of the duration of the call.

7.

An arrangement for operation and administration of multi-user computer application programs in systems of computers networked by means of the H.323 or SIP protocol, each of said systems including at least one Gatekeeper and at least one each of server and client for operating a client/server multi-user computer application, and, optionally, a firewall provided with H.323 or SIP proxy, wherein client registration and authorisation in the network are performed according to registration and authorisation method of H.323 or SIP ,
c h a r a c t e r i s e d i n that each gatekeeper, client, server and optional firewall element of the system is provided with a co-operating H.323 or SIP protocol

enhancement function means comprising a specific real-time codec being adapted to co-operate with a respective Gatekeeper, client, server or optional firewall element.

8.

Method of using of a H.323 or SIP telecommunication network arrangement in a computer network game system including a plurality of computer network game clients and at least one respective computer network game server, said server optionally being protected by a computer network firewall, c h a r a c t e r i s e d i n that the method comprises:

controlling a clients access to the server,

allowing, optionally, undisturbed data communication through the firewall between a server and a respective client,

obtaining data for a clients usage of the server, the data being useful for usage charging, and

handling and recording communication faults and irregularities.

9.

A method of providing co-operative real-time operation of a client part and a server part of a client-server real-time computer program application over a computer network, the client and server parts being adapted with a data exchange interface to a standard multimedia computer call control and communication program,

c h a r a c t e r i s e d i n

invoking a client part of a client-server real-time computer program application,

invoking a client call control part of a standard multimedia computer call control and communication program,

invoking a server part of said a client-server real-time computer program application,

invoking a server call control part of said standard multimedia computer call control and communication program, and

effecting a multimedia call from said client call control part to said server call control part, thereby establishing a real-time communication link between the client part of said client-server real-time computer program application and the server part of said client-server real-time computer program application.

10.

A method of establishing and running co-operative real-time operation of a client part and a server part of a client-server real-time computer program application over a computer network, the client and server parts being adapted with a data exchange

interface to a standard multimedia computer call control and communication program, , c h a r a c t e r i s e d i n :

invoking a client part of a client-server real-time computer program application,

invoking a client call control part of a standard multimedia computer call control and communication program,

invoking a server part of said a client-server real-time computer program application,

invoking a server call control part of said standard multimedia computer call control and communication program,

communicating a setup message from said client call control part to said server call control part,

communicating an accept message from said server call control part to said client call control part,

communicating a media suggestion and control receiver address message from said client call control part to said server call control part,

communicating a media accept and data destination message from said server call control part to said client call control part,

communicating a media suggestion and control receiver address message from said client call control part to said server call control part,

communicating a media accept and data destination message from said server call control part to said client call control part,

communicating a control message, as required by said application program server part, from said application program server part to said application program client part, and

communicating data, as specified by said control message, from said application program client part to said application program server part.

11.

The method of claim 10, c h a r a c t e r i s e d i n that communicating the control message and the data message, respectively, is effected by direct message communication between said application program client part and said application program server part.

12.

The method of claim 10, c h a r a c t e r i s e d i n that communicating the control message and the data message between said application program client part and said application program server part, respectively, is effected by communicating said messages via said client call control part and said server call control part.

13.

The method of claim 9 - 12, c h a r a c t e r i s e d i n that said standard multimedia computer call control and communication program operates according to H.323 or SIP.

14.

The method of claim 9 - 13, c h a r a c t e r i s e d i n that said client part of a client-server real-time computer program application and said client call control part of said standard multimedia computer call control and communication program operate on a first computer platform, and

that said server part of said a client-server real-time computer program application and said server call control part of said standard multimedia computer call control communication program operate on another computer platform.

ABBREVIATIONS, DEFINITIONS AND ACRONYMS.

ANSI	American National Standardisation Institute
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
ASN.1	Abstract Syntax Notation Number 1 (a formal data structure definition language)
Codec	Coder/Decoder
E-164	A standard numbering scheme
ETSI	European Telecommunication Standards Institute
GK	Gatekeeper
HTTP	Hyper Text Transport Protocol
IP	Internet Protocol
IPT	Internet Telephony
ISDN	Integrated Services Digital Network
ISP	Internat Service Provider
ITU H.225.0	A subset of the H.323 standards suite being based on Q.931 and defining call control messages, encoding standards and call-state sequences.
ITU H.245	ITU-T Recommendation, "Control protocol for multimedia communication", 02/98.
ITU H.323	ITU-T Recommendation, "Packet-based multimedia communications system", 02/98, specifies signalling and transport for multimedia traffic over a packet switched network. (A family of ASN.1 encoded protocols defining message formats, encoding standards and call state sequences of multimedia conferences on an Internet protocol infrastructure.)
ITU H.450	A suite of ASN.1 standards defining service control protocols to be used for service control in an H.323 network. The H.450 messages are being carried within H.225.0 messages.
ITU Q.931	Telephony standard for call control that defines call control messages, encoding standards and call-state sequences.
ITU-T	International Telecommunication Union – Telecommunications sector
NAT	Network Address Translation

RAS	Registration, Admission and Status
RTP	Real Time Protocol
SIP	"SIP, Session Initiation Protocol", Internet Engineering Task Force, RFC 2543, March 1999, (Handley, M., Schulzrinne, H., Schooler E., Rosenberg J)
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

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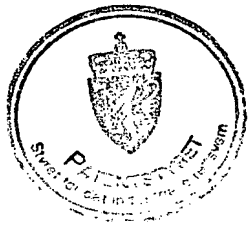
- 5 JAN 2001

Abstract

O. nr. E12053

The invention provides a solution for alleviating problems related to operation and administration of multi-user application programs, particularly real-time applications, in systems of networked computers by means of a novel feature, implemented as an enhancement of a selected call control protocol, such as the H.323 or SIP protocol. Each client, server, Gatekeeper and optional firewall means of a system according to invention is provided with a specific real-time codec with a common interface adapted to a multimedia call control protocol, such as H.323 or SIP, the codec being adapted to co-operate with each of said means. Thus, for example, each of said client means is allowed to use its data communication protocol of choice without the need for the same data communication protocol choice on the server side of the application.

(fig. 3)



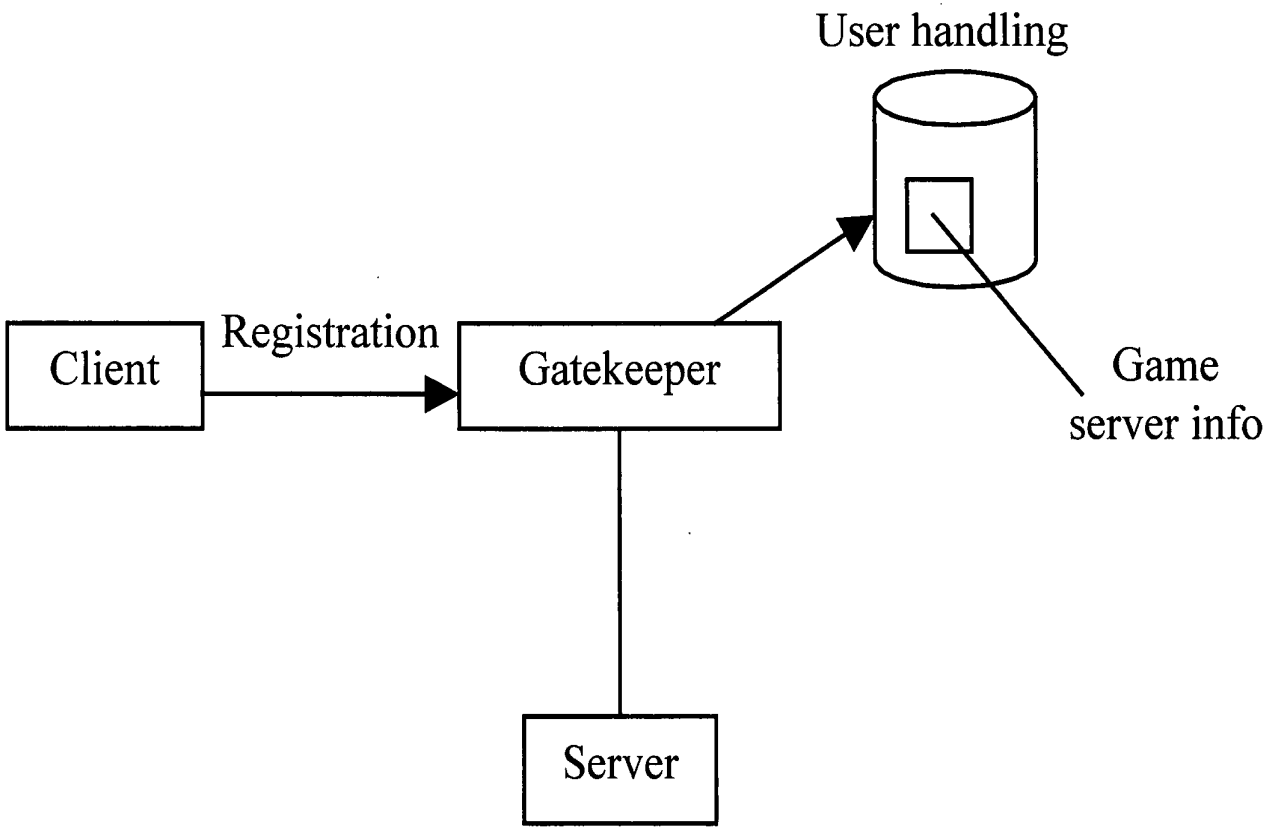

User handling
Client
Registration
Gatekeeper
Game
server info
Server

Fig. 1

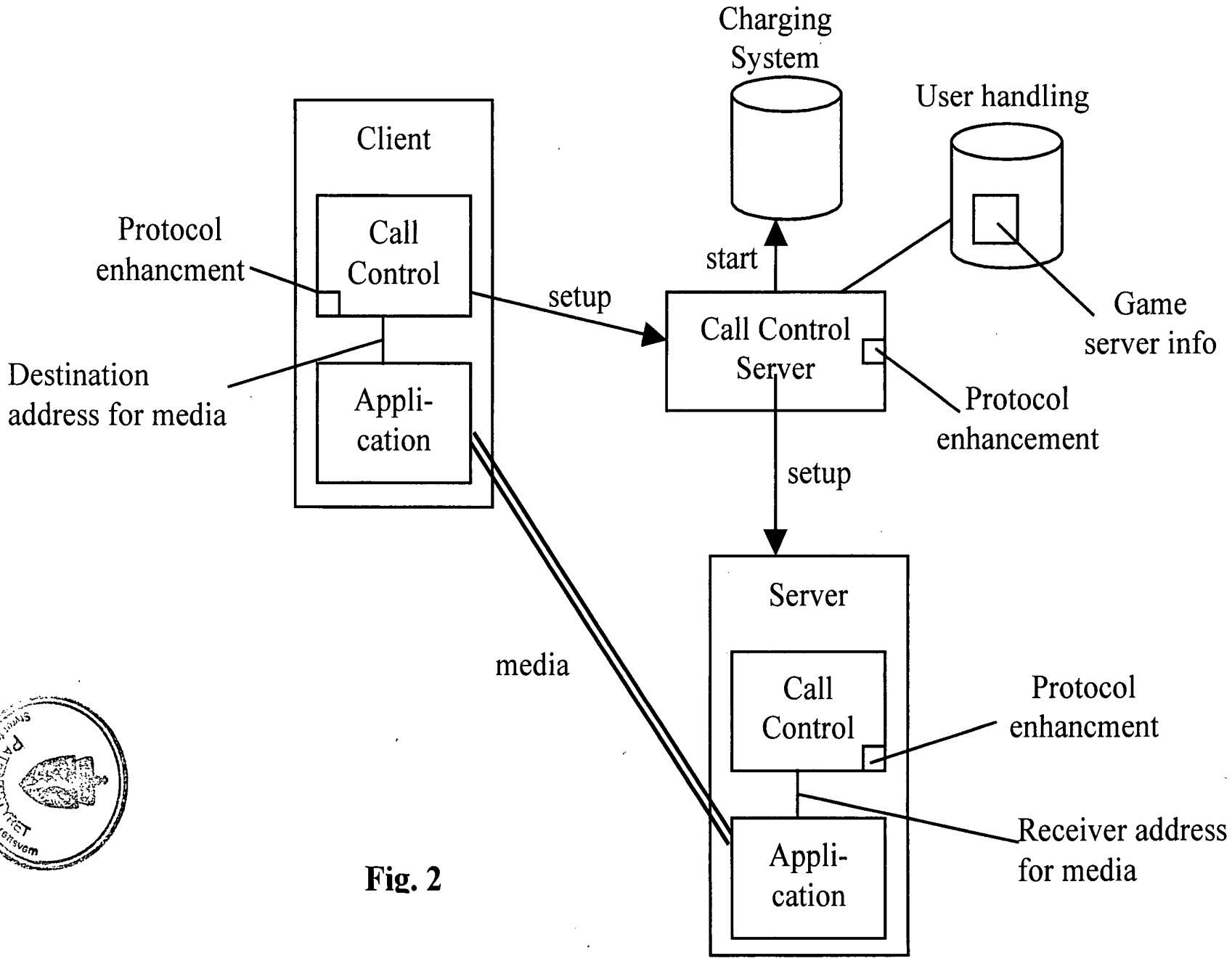


Fig. 2

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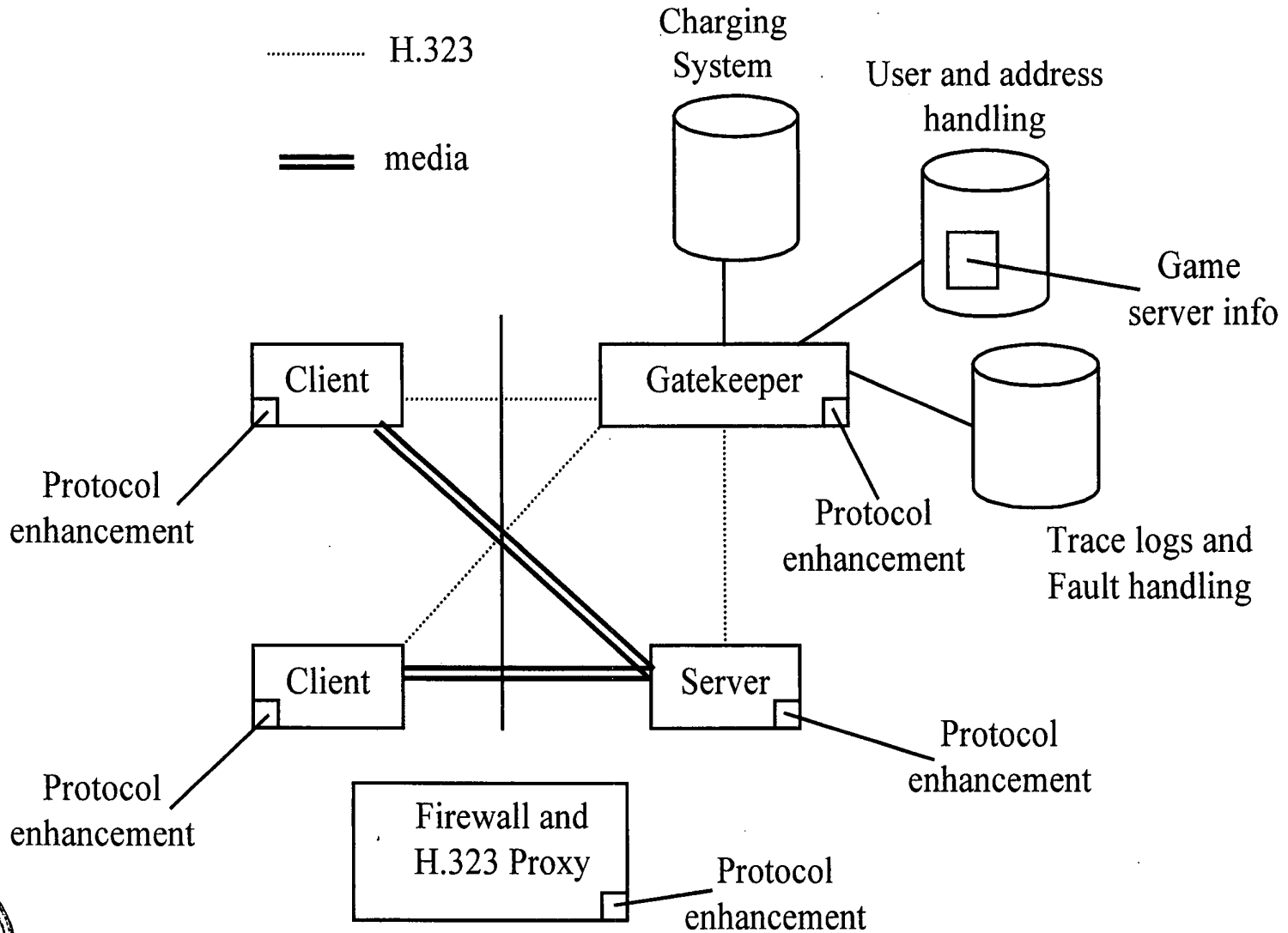

Fig. 3

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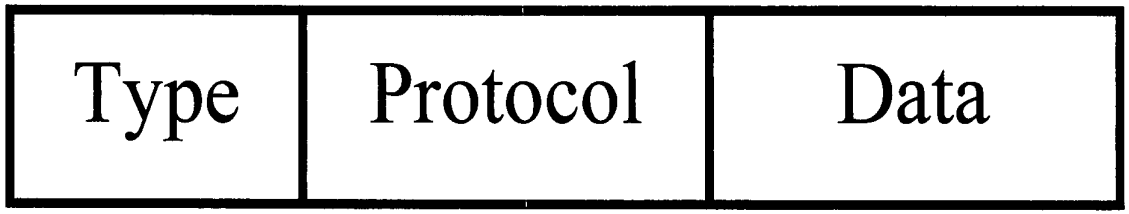

Fig. 4

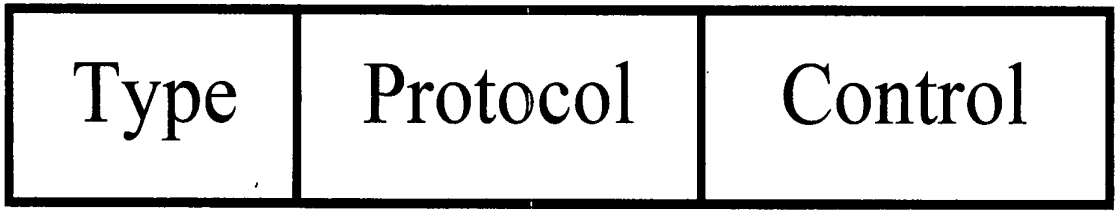

Fig. 5

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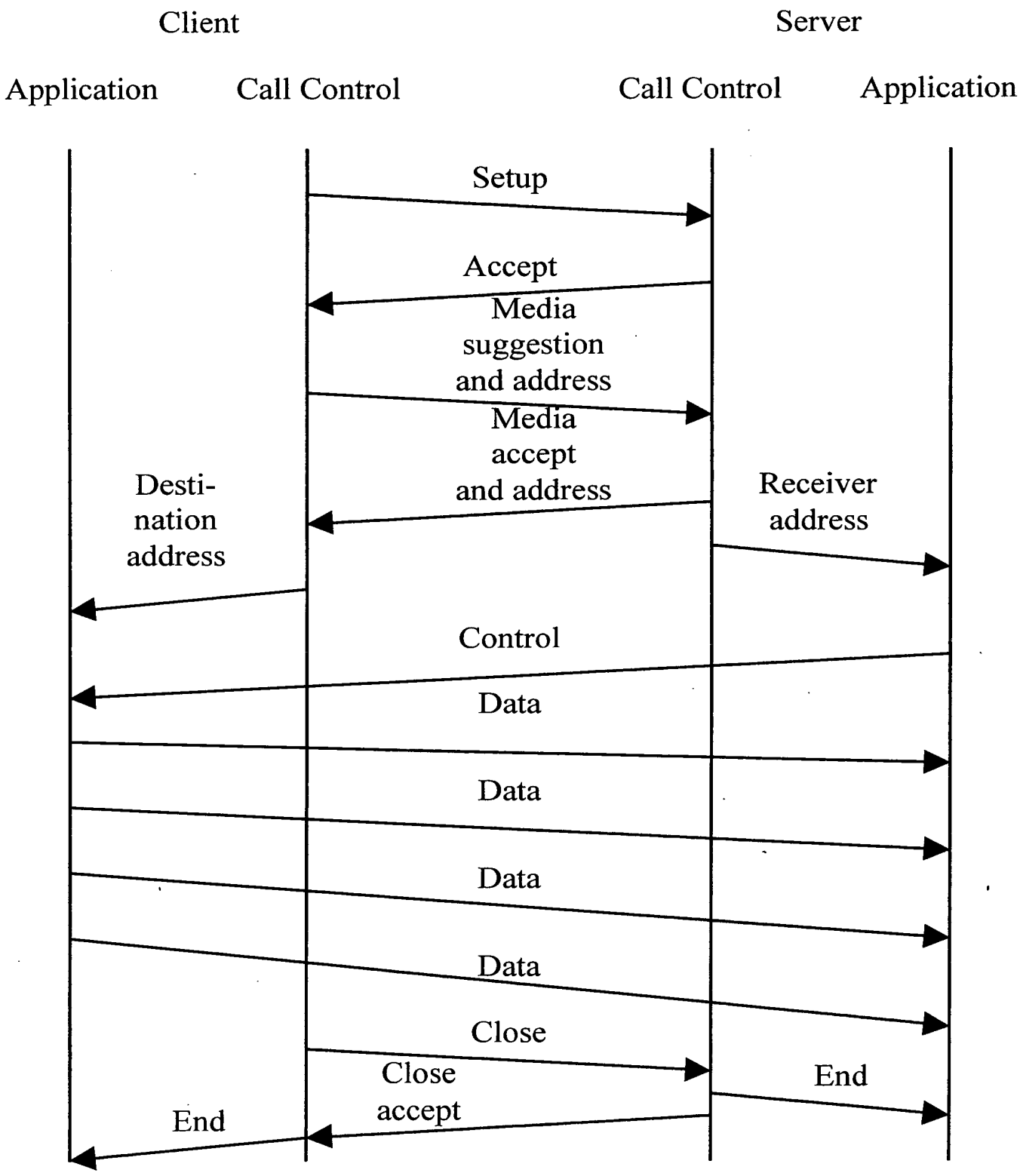

Fig. 6

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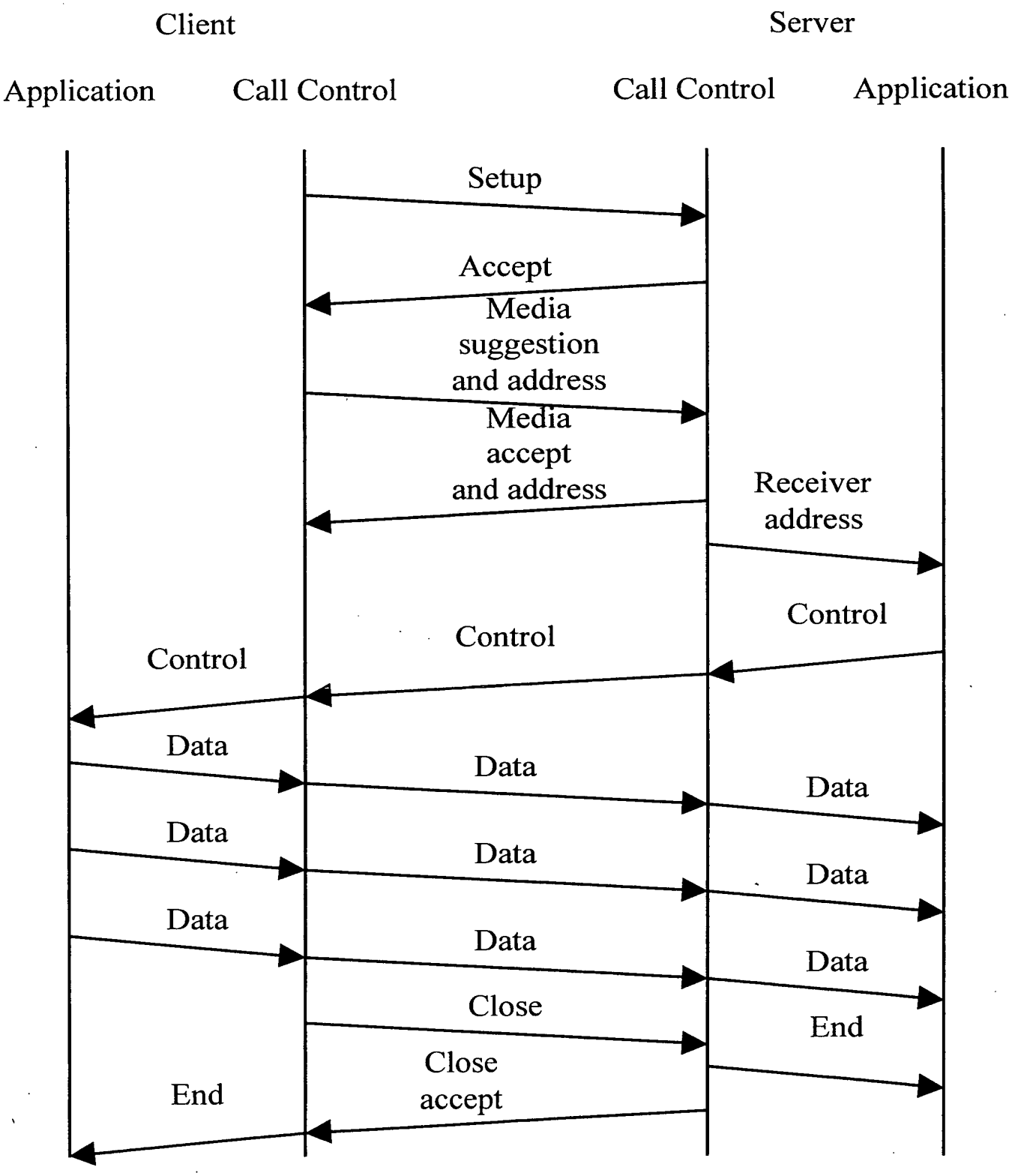

Fig. 7

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